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N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

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Research Design

Contributors
Sonia A. Duffy, PhD, RN
Lisa Kane Low, PhD, CNM, FACNM
Huey-Ming Tzeng, PhD, RN
Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Causality
A
Pressure
B
Ulcere

Multicausality
Years smoking
High fat diet
Limited exercise
Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

• **Controlling extraneous variables**

  ▪ Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  ▪ Random sampling
  ▪ Sample: Heterogenous, homogeneous, or matching
  ▪ Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

- **Is there a treatment?**
  - Yes
  - No

- **Is the treatment tightly controlled by the researcher?**
  - Yes
  - No

- **Is the primary purpose examination of relationships?**
  - Yes
  - No

- **Descriptive Design**
  - No
  - Yes

- **Quasi-Experimental Study**
  - No
  - Yes

- **Will the sample be studied as a single group?**
  - No
  - Yes

- **Correlational Design**
  - No
  - Yes

- **Will a randomly assigned control group be used?**
  - No
  - Yes

- **Is the original sample randomly selected?**
  - No
  - Yes

- **Experimental Study**
Selecting a Descriptive Design

Examining sequences across time?
- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design
- Yes
  - Following same subjects across time?
    - No
      - Cross-sectional design
    - Yes
      - Studying events partitioned across time?
        - No
          - Trend Analysis
        - Yes
          - Repeated measures of each subject
  - Yes
    - Single unit of study
      - No
        - Longitudinal Study
      - Yes
        - Case Study

Research Design

Cross-sectional design with treatment partitioning
Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification ➔ Measurement ➔ Description ➔ Interpretation

Phenomenon of Interest

- Variable 1
- Variable 2
- Variable 3
- Variable 4

Description of Variable 1
Description of Variable 2
Description of Variable 3
Description of Variable 4

Interpretation of Meaning
Development of Hypotheses
A Comparative Descriptive Design

Group I
{variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Group II
{variables measured}

Describe

Development of Hypotheses

Research Design
Selecting the Type of Correlational Design

- **Describe relationships between/among variables?**
  - Descriptive correlational design

- **Predict relationships between/among variables?**
  - Predictive correlational design

- **Test theoretically proposed Relationships?**
  - Model testing design
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

- Control Group?
  - No
    - Pretest?
      - No
        - One-group post-test only design
      - Yes
        - Repeated Measures?
          - No
            - Strategy for Comparison
              - No
                - Suggest Reevaluating design
              - Yes
                - Compare treatment & control conditions?
          - Yes
            - Repeated Measures?
Selecting The Type of Experimental Design

**Pretest**

- No
  - Post-test only control group design

- Yes
  - Repeated Measurements?
    - No
      - Examine effects of confounding variables?
        - No
          - Multiple sites?
            - No
              - Pretest/post-test control group design
            - Yes
              - Randomized clinical trials
    - Yes
      - Blocking?
        - No
          - Comparison of multiple levels of treatment
            - No
              - Examination of complex relationships among variables in relation to treatment
            - Yes
              - Nested Designs
        - Yes
          - Randomized Block Design
Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Treatment:</th>
<th>Under control of researcher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findings:</td>
<td>Comparison of pretest and post-test scores</td>
</tr>
<tr>
<td></td>
<td>Comparison of experimental and control groups</td>
</tr>
<tr>
<td></td>
<td>Comparison of pretest-post-test differences between samples</td>
</tr>
<tr>
<td>Uncontrolled threats to validity:</td>
<td>Testing Mortality</td>
</tr>
<tr>
<td></td>
<td>Instrumentation Restricted generalizability as control increases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Randomly selected control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement of dependent variables</td>
<td>Measurement of dependent variables</td>
</tr>
<tr>
<td>Manipulation of independent variables</td>
<td>Manipulation of independent variables</td>
</tr>
<tr>
<td>PRETEST</td>
<td>PRETEST</td>
</tr>
<tr>
<td>TREATMENT</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>POST-TEST</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>
# Post-Test-Only Control Group Design

## Research Design

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>POST-TEST</td>
</tr>
<tr>
<td></td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:**
- Instrumentation
- Mortality
- Limited generalizability as control increases
### Nested Design

#### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRN Medication</td>
<td>Unit E</td>
<td>Unit F</td>
<td>Unit G</td>
<td>Unit H</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New approach: “Around the clock” medication</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

#### Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
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Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design